UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/586,441	06/02/2000	Slobodan Nedic	P/3341-8	7204

2352 7590 07/13/2005

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK, NY 100368403

EXAMINER	
BURD, KEVIN MICHAEL	
ART UNIT	**PAPER NUMBER**
2631	

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/586,441	NEDIC, SLOBODAN	
	Examiner	Art Unit	
	Kevin M. Burd	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,7-12,15-27 and 44-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *21-27 and 44-50* is/are allowed.

6)☒ Claim(s) *1-4,7-12 and 15-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. This office action, in response to the amendment filed 4/29/2005, is a non-final office action.

Response to Arguments

2. Applicant's arguments with respect to claims 1-4, 7-12 and 15-20 have been considered but are moot in view of the new grounds of rejection stated below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US 6,754,261) in view of Hunt et al (US 5,400,322) further in view of Herzberg (US 6,459,678).

Regarding claims 1 and 7-10, Liu discloses a receiver circuit for providing a decoded output from a DMT input signal (figure 8 and column 4, lines 21-23). The input signal is digital (figure 8, 831). A first stage 833 applies a discrete Fourier transform to the input signal. The frequency samples are processed in block 834, which performs gain scaling and FEQ on a per-subchannel (per-bin) basis, slices the sample in each sub-channel to the nearest constellation point and decodes the constellation points to

recover the transmitted information bits (column 8, lines 4-9). A time domain equalizer stage is shown in 832. The primary function of the TEQ is to "shorten" the transmission channel of a DMT signal so that the combined (shortened) channel has energy confined to the cyclic prefix window (column 8, lines 14-18). This is the time domain windowing and occurs prior to the DFT. Liu does not disclose using a MLSE algorithm to recover the original transmitted data.

Hunt discloses using a trellis decoder for receiving the output of a FEQ as shown in figure 2. The output of the FEQ in the unit 42 are converted by the trellis decoder 42, operating in accordance with the Viterbi algorithm to perform maximum likelihood sequences estimation (column 5, lines 21-25). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Hunt into the receiver of Liu. The trellis decoder is well known in the art of data communications for minimizing inter-symbol interference in multi-carrier communication systems. Therefore, the originally transmitted data will be recovered faster than if more interference was present. The combination of Liu and Hunt does not disclose a per-bin equalizing stage prior to the decoding stage wherein the per-bin equalizing stage comprises a bank of per-bin equalizers corresponding to active bins of an output from the first stage.

Herzberg discloses the frequency domain equalizer 56 shown in figure 3. The equalizer 56 receives the output of the FFT module 54 and outputs signals to complex DMT decoder 58. Equalizer 56 generally represents a plurality of equalizer filters for the DMT sub-channels (column 4, line 67 to column 5, line 1). Equalizer 56 is used to

compensate for the transfer function of the communication medium to map complex values into filtered values that fall into the same decision boundaries used to distinguish between complex values for the same sub-channel (column 5, lines 1-5). This corrects for the effects of noise and attenuation due to distortion caused by the communication medium (column 4, lines 63-66). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to incorporate the equalizers of Herzberg into the combination of Liu and Hunt.

Regarding claim 2, the time domain equalizer (TEQ) is disclosed in figure 8 of Liu.

Regarding claim 3, the windowing occurs after the TEQ (Liu: column 8, lines 13-22).

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US 6,754,261), Hunt et al (US 5,400,322) and Herzberg (US 6,459,678) further in view of Belotserkovsky et al (US 6,628,735).

Regarding claim 4, Liu, Hunt and Herzberg disclose a receiver and method for receiving signals as stated above in paragraph 3. The combination does not disclose using a Hanning window for windowing the time domain signal. Belotserkovsky discloses time domain windowing the received digital signal in figure 6. Applying the window function to the sampled data produces two benefits. First the main lobe of each pilot bin will be widened or spread and the sidelobes of the pilot bins will be lowered and cause less interference with neighboring pilot bins (column 7, lines 13-27). It would have

been obvious for one of ordinary skill in the art at the time of the invention to incorporate the windowing of Belotserkovsky into the receiver of the combination of Liu, Hunt and Herzberg for the reasons stated above.

5. Claims 11, 12 and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US 6,754,261), Hunt et al (US 5,400,322) and Herzberg (US 6,459,678) further in view of Zheng (US 5,477,465)

Regarding claims 11, 15 and 17-19, Liu discloses a receiver circuit for providing a decoded output from a DMT input signal (figure 8 and column 4, lines 21-23). The input signal is digital (figure 8, 831). A first stage 833 applies a discrete Fourier transform to the input signal. The frequency samples are processed in block 834, which performs gain scaling and FEQ on a per-subchannel (per-bin) basis, slices the sample in each sub-channel to the nearest constellation point and decodes the constellation points to recover the transmitted information bits (column 8, lines 4-9). Liu does not disclose using a MLSE algorithm to recover the original transmitted data.

Hunt discloses using a trellis decoder for receiving the output of a FEQ as shown in figure 2. The output of the FEQ in the unit 42 are converted by the trellis decoder 42, operating in accordance with the Viterbi algorithm to perform maximum likelihood sequences estimation (column 5, lines 21-25). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Hunt into the receiver of Liu. The trellis decoder is well known in the art of data communications for minimizing inter-symbol interference in multi-carrier communication systems.

Therefore, the originally transmitted data will be recovered faster than if more interference was present. The combination of Liu and Hunt does not disclose a per-bin equalizing stage prior to the decoding stage wherein the per-bin equalizing stage comprises a bank of per-bin equalizers corresponding to active bins of an output from the first stage.

Herzberg discloses the frequency domain equalizer 56 shown in figure 3. The equalizer 56 receives the output of the FFT module 54 and outputs signals to complex DMT decoder 58. Equalizer 56 generally represents a plurality of equalizer filters for the DMT sub-channels (column 4, line 67 to column 5, line 1). Equalizer 56 is used to compensate for the transfer function of the communication medium to map complex values into filtered values that fall into the same decision boundaries used to distinguish between complex values for the same sub-channel (column 5, lines 1-5). This corrects for the effects of noise and attenuation due to distortion caused by the communication medium (column 4, lines 63-66). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to incorporate the equalizers of Herzberg into the combination of Liu and Hunt. The combination of Liu, Hunt and Herzberg does not disclose a frequency domain windowing stage disposed between the DFT and the decoding stage.

Zheng discloses spectral energy information can be made even more accurate by reducing the leakage of one frequency to another, which is typical for DFT, by applying some windowing to the input signal (column 4, lines 30-46). Therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to

combine the teachings of Zheng into the combination of Liu, Hunt and Herzberg. The windowing techniques are advantageous because the bands are centered around tones and these windows prevent errors for tones near the edges of the frequency bands (column 4, lines 30-46).

Regarding claim 12, Liu discloses a TEQ in figure 8 prior to the DFT.

Regarding claim 16, the windowing will occur after the DFT.

Regarding claim 20, Zheng discloses using a Hanning window (column 4, lines 30-46).

Allowable Subject Matter

6. Claims 21-27 and 44-50 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Burd whose telephone number is (571) 272-3008. The examiner can normally be reached on Monday - Friday 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin M. Burd
7/11/2005

KEVIN BURD
PRIMARY EXAMINER